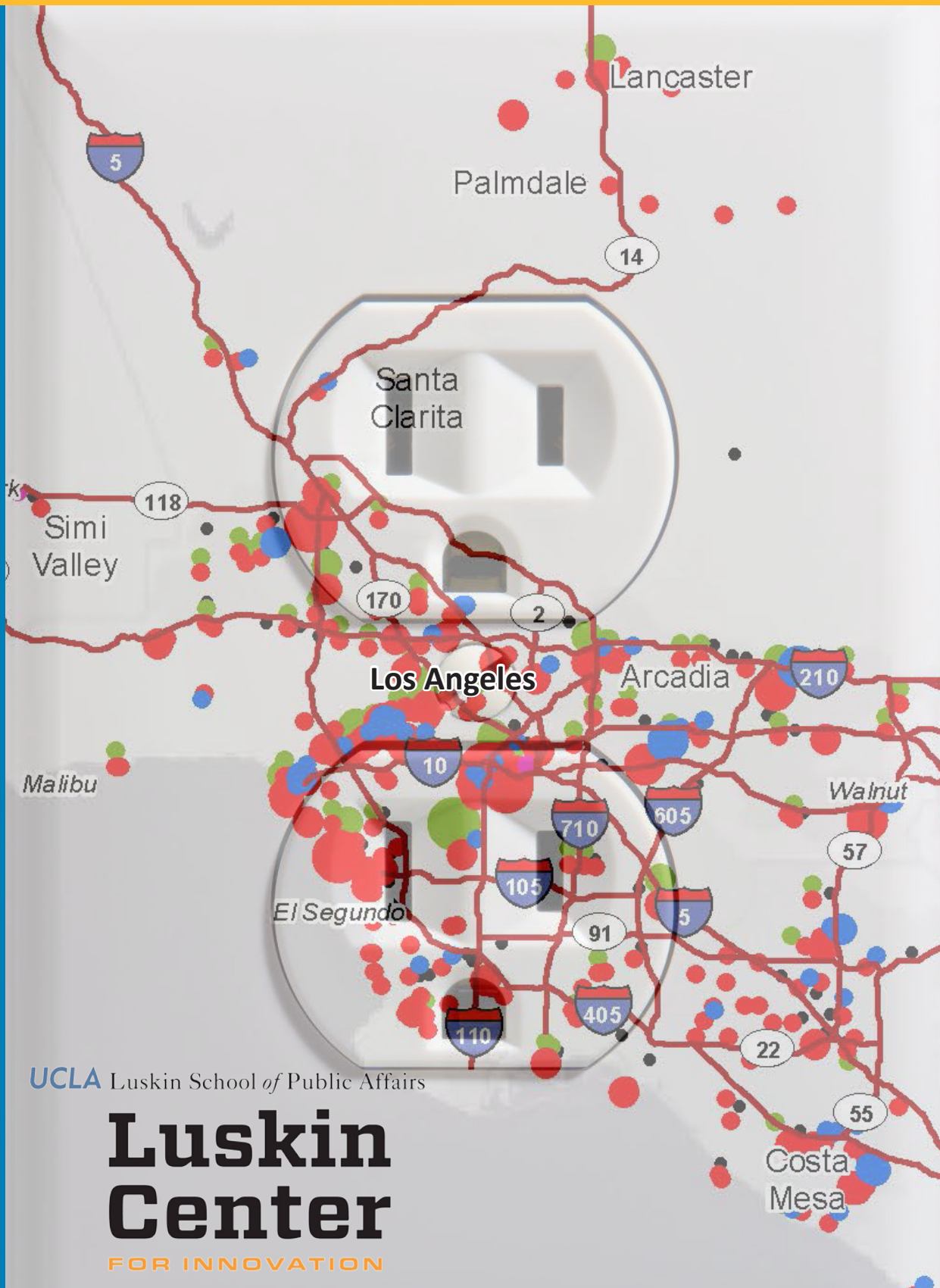


# Southern California Plug-in Electric Vehicle Atlas



UCLA Luskin School of Public Affairs

**Luskin  
Center**  
FOR INNOVATION

# SOUTHERN CALIFORNIA PLUG-IN ELECTRIC VEHICLE READINESS ATLAS

## About this Document

This document was prepared for the Southern California Association of Governments (SCAG) by the UCLA Luskin Center for Innovation. It constitutes Deliverable 11 of SCAG contract 12-021-C1 to support regional planning for plug-in electric vehicle (PEV) adoption. SCAG is coordinating a multi-stakeholder group of government agencies, utilities, and university researchers to prepare multi-faceted and interdisciplinary regional PEV readiness plans. Among other purposes, these plans will help illuminate and guide strategic infrastructure investment, PEV-related economic development, and supportive policy design in Southern California.

## Disclaimer

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## Acknowledgements

We thank the Southern California Association of Governments, the South Coast Air Quality Management District, U.S. Department of Energy, and the California Energy Commission for support of this project. In particular, we thank Marco Anderson of SCAG, Patricia Kwon of SCAQMD and the other governmental and utility members of the SoCal PEV Coordinating Council for their guidance and assistance. We also thank the University of California Office of the President Multicampus Research Programs and Initiatives for its support.

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**SOUTHERN CALIFORNIA**  
**PLUG-IN ELECTRIC VEHICLE READINESS ATLAS**

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# PREFACE

## Council of government-level maps

Plug-in Electric Vehicles (PEVs) may provide a range of important benefits. For drivers, PEVs are a way to save money on fuel, avoid trips to the gasoline station, contribute to energy independence, and improve local air quality. For utilities, PEVs represent a new source of demand for power even as they support efficient use of energy produced during overnight hours. For state and regional air-quality regulators, PEVs help reduce criteria air pollutants and greenhouse gas (GHG) emissions.

To fully realize the benefits of PEVs, planners must coordinate and facilitate the growth of two complementary markets: one for PEVs and another for the electric charging opportunities that these vehicles need to refuel. This Atlas describes how many PEVs are in a given neighborhood and how their spatial concentrations vary over the course of a day as their drivers travel to workplaces and retail destinations. This Atlas also projects PEVs growth over the next ten years within neighborhoods and municipalities in each of the 15 councils of government (COGs) within the Southern California Association of Governments region.

This Atlas also maps potential charging infrastructure opportunities to support and complement growth in the PEV market. It identifies the locations and sizes of workplaces, multi-unit residences and retail establishments that could potentially host PEV charging. Lastly, the Atlas includes maps of other resources that support PEV charging, such as existing publicly-accessible charging stations and stand-alone parking facilities.

This spatial information enables to planners to know where PEVs are currently and where growth will occur in the future. This will help them prioritize the municipal planning reforms such as those described in the Southern California PEV Readiness Plan. It describes where latent PEV demand is constrained because of the challenges of installing charging opportunities in multi-unit residences. It also describes the locations of workplaces and retail establishments that are in neighborhoods with a higher density of PEVs during the day and evening. With this information, planners can take the next steps to provide the targeted technical assistance to these sites as described in the Southern California PEV Readiness Plan.

The technical appendix that follows the Atlas provides detailed information on data sources and analyses used to generate each map. This Atlas features the following maps of the neighborhoods and municipalities within each COG in the SCAG region:

1. **PEV registration density as of 2012.** Knowing how many PEVs are currently registered in a given area will indicate the location of current and near-future demand for residential charging. By extension, this information can help planners and utilities anticipate locations that will carry additional nighttime electrical load.
2. **PEV morning travel to work, providing spatial daytime PEV density at or near workplaces.** Understanding where PEVs are concentrated during morning peak hours (6:00 a.m. to 9:00 a.m.) can help planners and utilities identify neighborhoods where there will be demand for daytime charging.



3. **Workplaces identified by numbers of employees.** Planners can target the largest employers for workplace charging initiatives, as they presumably host the largest numbers of parking spaces on-site and can potentially serve the highest numbers of employees.
4. **Workplaces overlaid with morning peak PEV density.** Planners and utilities can use these maps to assess the potential utilization of workplace charging by comparing the spatial distribution of employers and weekday morning peak travel destinations for PEVs.
5. **Publicly-accessible charging locations, identified by power level and number of stations per location.** Planners can use these maps to compare the location of existing publicly-accessible charge stations with the locations of employment centers, retail centers and PEV daytime destinations, also mapped at the COG level in the Atlas. The maps can also be used to identify where there are gaps in meeting demand for charging. For MUDs that do not have parking, publicly-accessible sites will become important charging options. The maps identify the number of charging units/cords available at each location along with the level of service (Level 1, Level 2, etc., or “Unknown” where there is charging available but the quantity of connectors and their level of service could not be immediately determined). The maps are based on information collected during the summer and fall of 2012.
6. **Multi-unit dwellings (MUDs) by number of units and density.** City planners can use these maps to identify specific buildings and/or MUD owners that could potentially host charging on-site. Planners can use the maps to compare spatial distributions of MUD density with employment and commercial density, publicly accessible charging stations, and stand-alone parking areas to assess the potential for these other PEV sites to serve the charging needs of MUD residents. Mapping the precise location of MUDs and knowing the density of units on a site will be of particular use in utility planning. Utilities can use such maps to anticipate where upgrades may be needed for transformers and distribution stations to accommodate PEV charging at MUDs.
7. **Retail destinations, from strip development to regional centers.** Many PHEV drivers find it valuable to charge when visiting retail destinations in order to maximize electric miles driven. After locating general categories of retail charging opportunities on the map, planners can turn to Chapter 8 of the Southern California PEV Readiness Plan for more detailed descriptions of how long cars are typically parked at specific types of retail destinations.
8. **Retail destinations overlaid with PEV mid-day travel, providing spatial retail PEV density at or near retail centers.** Planners and utilities can use these maps to assess potential for retail charging by comparing the spatial distribution of retail centers and mid-day travel destinations (9:00 a.m. to 3:00 p.m.) for PEVs.
9. **Stand-alone parking facilities.** Publicly-accessible parking facilities can fill a gap in PEV charging, particularly in older urban cores where retail stores and even some workplaces and multi-unit dwellings do not have dedicated parking. Park and ride lots in particular may substitute for Level 1 workplace charging if workers leave their PEVs parked all day. Parking lots and structures greater than 2.5 acres that are not attached to other land uses are mapped at the COG level.

The Atlas provides this suite of spatial tools for PEV readiness planning for the following COGs:

Arroyo Verdugo Subregion	San Bernardino Associated Governments
City of Los Angeles	San Fernando Valley Council of Governments
Coachella Valley Association of Governments	San Gabriel Valley Council of Governments
Gateway Cities Council of Governments	South Bay Cities Council of Governments
Imperial County Transportation Commission	Ventura County Council of Governments
Las Virgenes Malibu Council of Governments	Western Riverside Council of Governments
North Los Angeles County	Westside Cities Council of Governments
Orange County Council of Governments	

## Utility PEV growth projections

The Southern California Plug-in Electric Vehicle Atlas also provides projections of PEV growth and electric miles driven over 10 years by utility service territory for the following utilities<sup>1</sup>:

Azusa Light and Power	Imperial Irrigation District
Burbank Water and Power	Los Angeles Department of Water and Power
Cerritos Electric Utility	Riverside Public Utilities
Glendale Water and Power	Southern California Edison
Pasadena Water and Power	Anza Electric Cooperative
Vernon Light and Power	City of Industry Electric Utility Service
Anaheim Public Utilities Department	Moreno Valley Electric Utility
City of Banning Electric Utility	Rancho Cucamonga Municipal Utility
City of Colton Utilities Services	San Diego Gas & Electric (portion within SCAG)

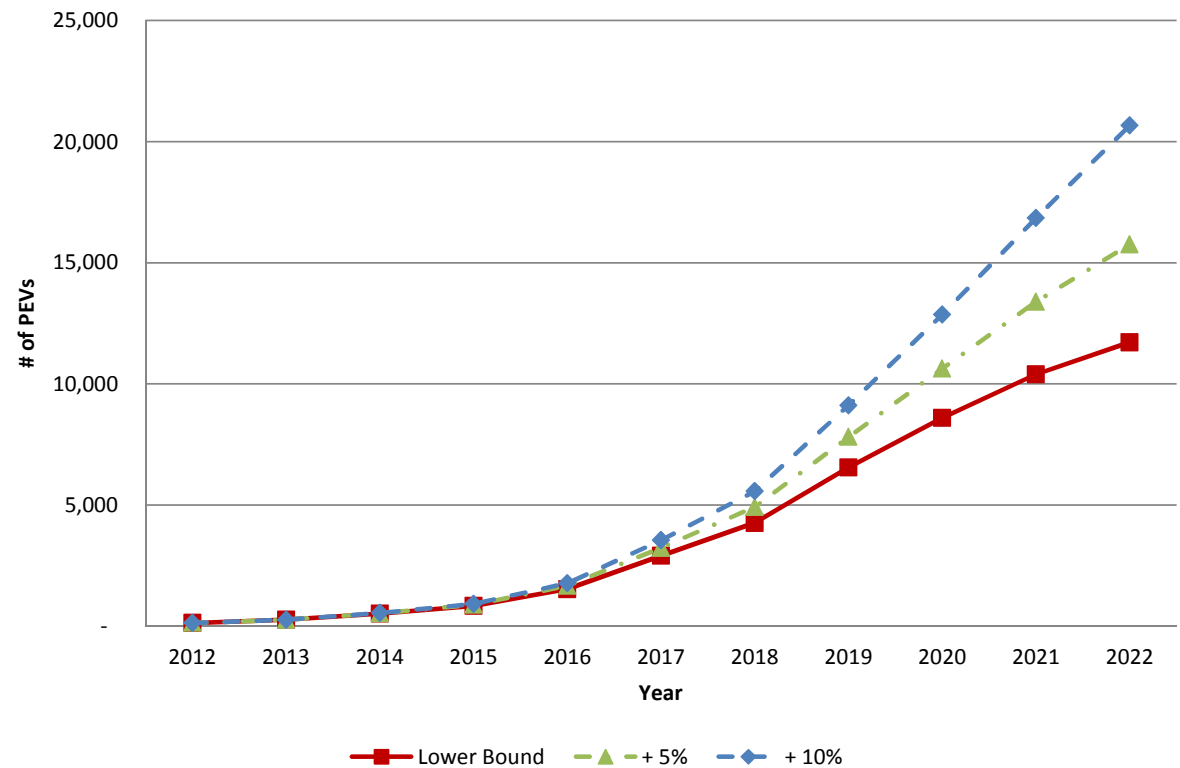
These projections are designed to help regional planners and utilities locate current and future demand for PEV charging and coordinate efforts to meet that demand.

<sup>1</sup> Utilities not represented by the Southern California Public Power Authority and that have less than 2 PEVs attributable to their service territories have been excluded from this analysis. They are Bear Valley Electrical Service, Corona Water and Power, Needles Public Utility Authority, and Victorville Municipal Utility Services.

# LAS VIRGENES MALIBU COUNCIL OF GOVERNMENTS

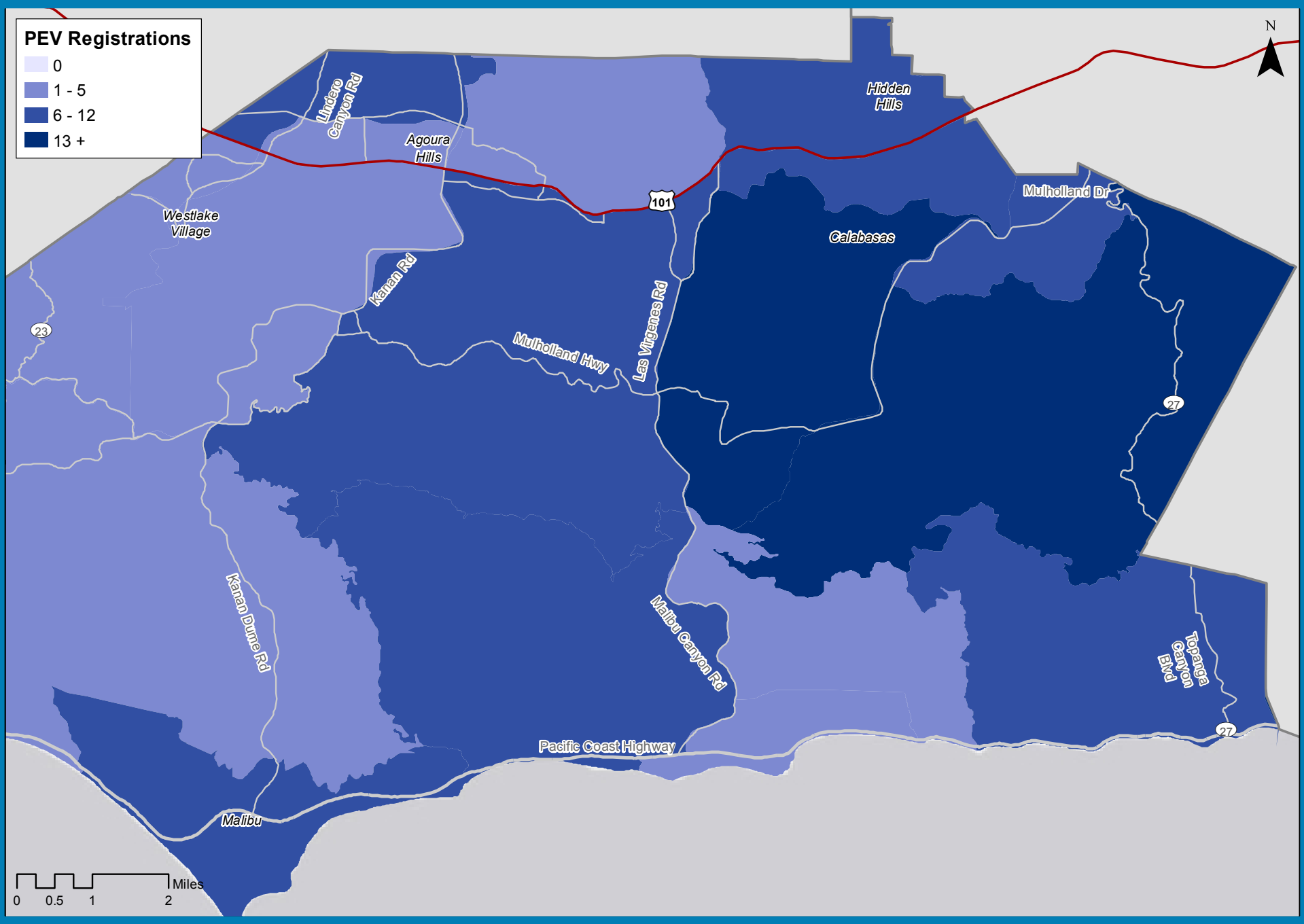
## PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	136	136	136
2013	272	272	272
2014	525	539	544
2015	836	885	920
2016	1,533	1,667	1,780
2017	2,905	3,241	3,549
2018	4,265	4,920	5,566
2019	6,558	7,812	9,116
2020	8,595	10,629	12,860
2021	10,396	13,387	16,840
2022	11,717	15,758	20,664

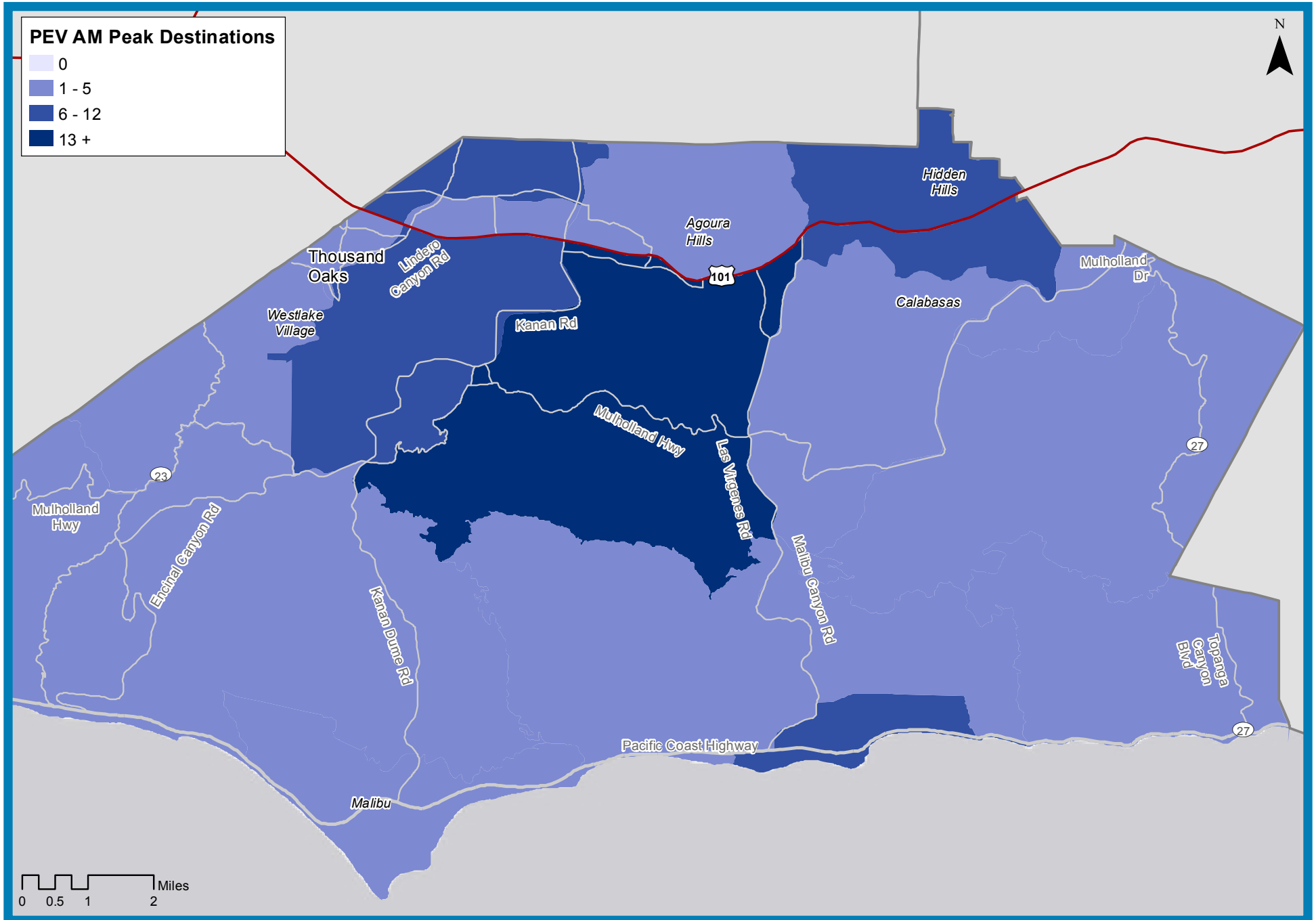


\* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

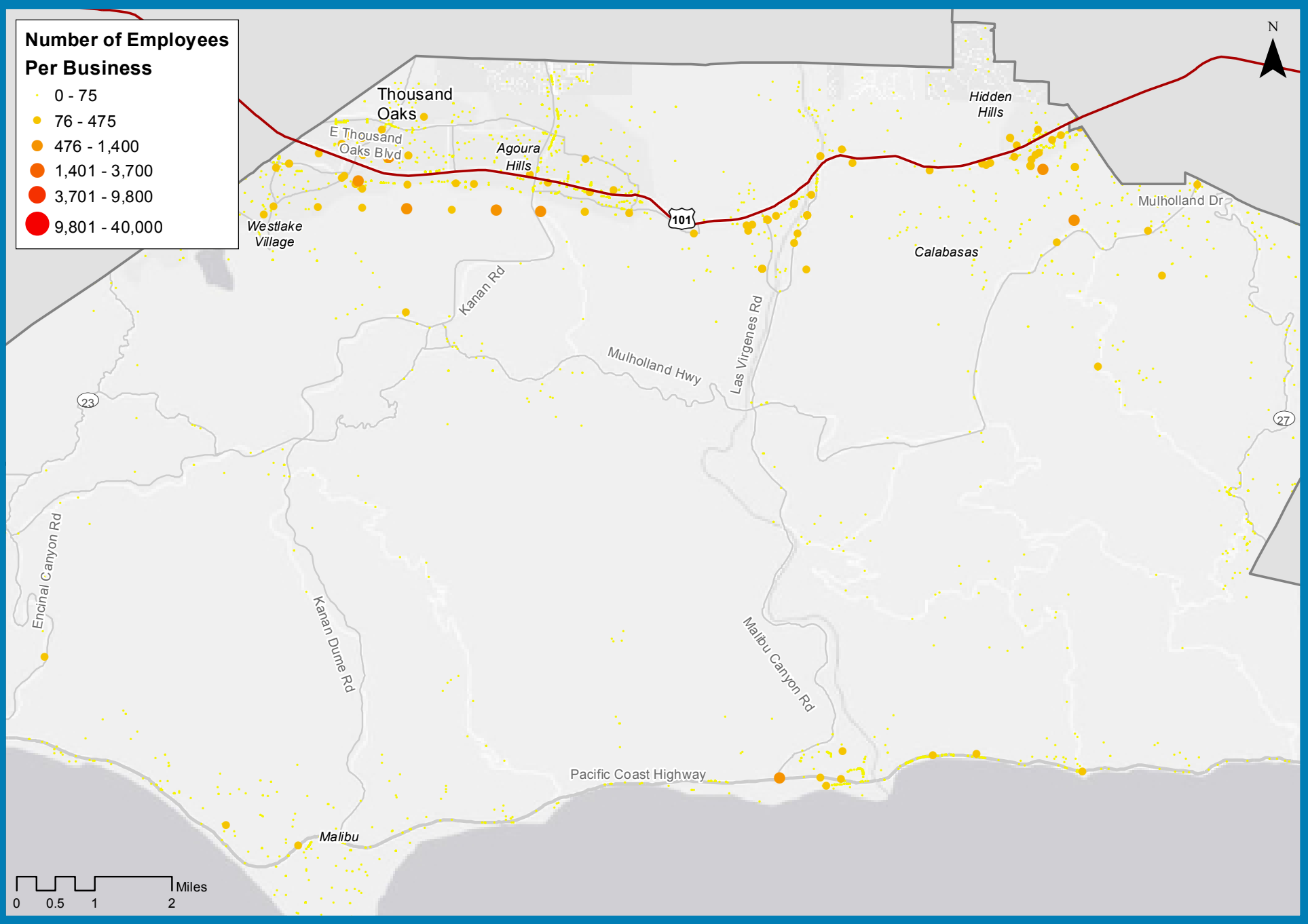
# Plug-in Electric Vehicle Registrations



## Plug-in Electric Vehicle Morning Peak Destinations

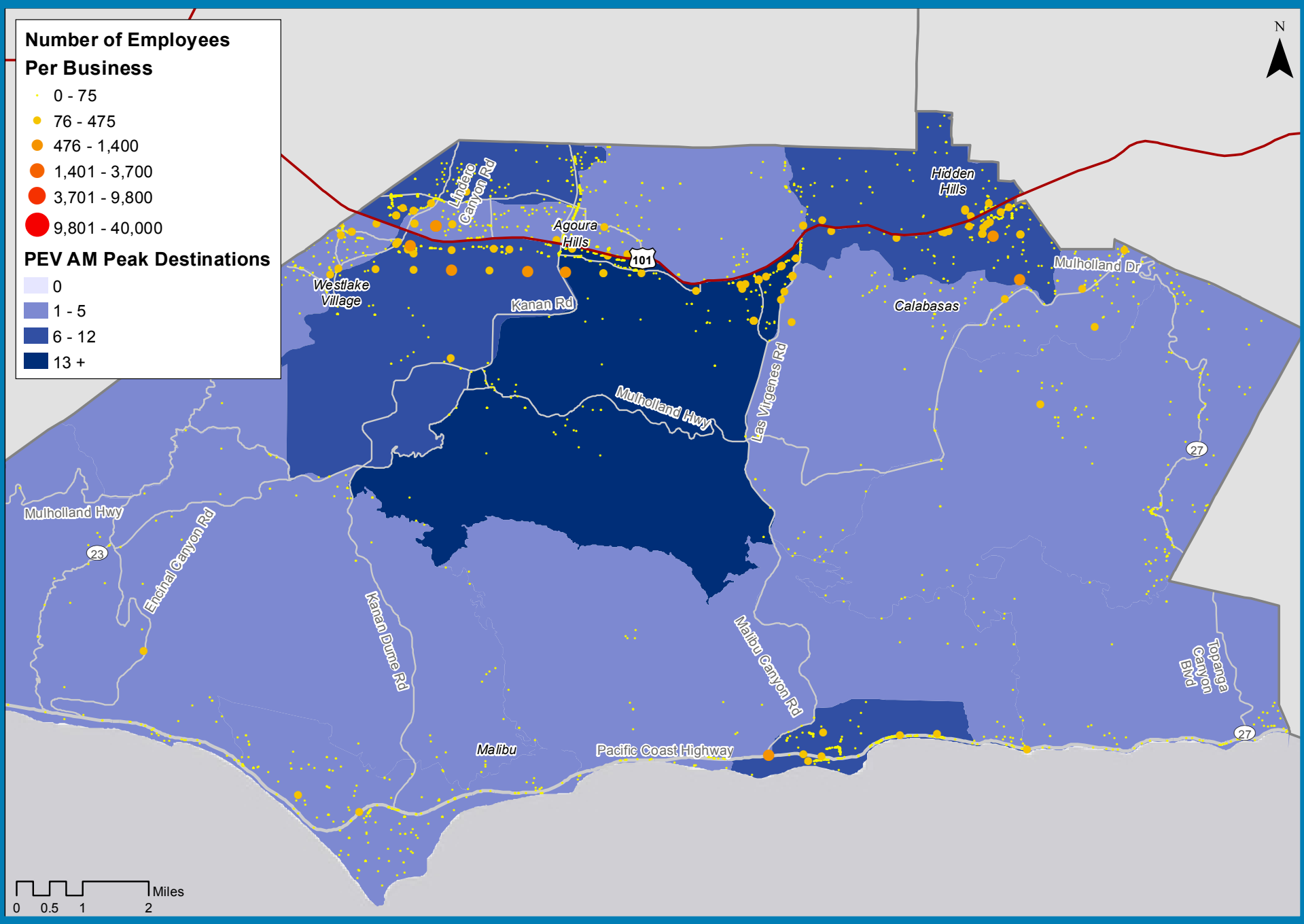


# Workplaces by Number of Employees

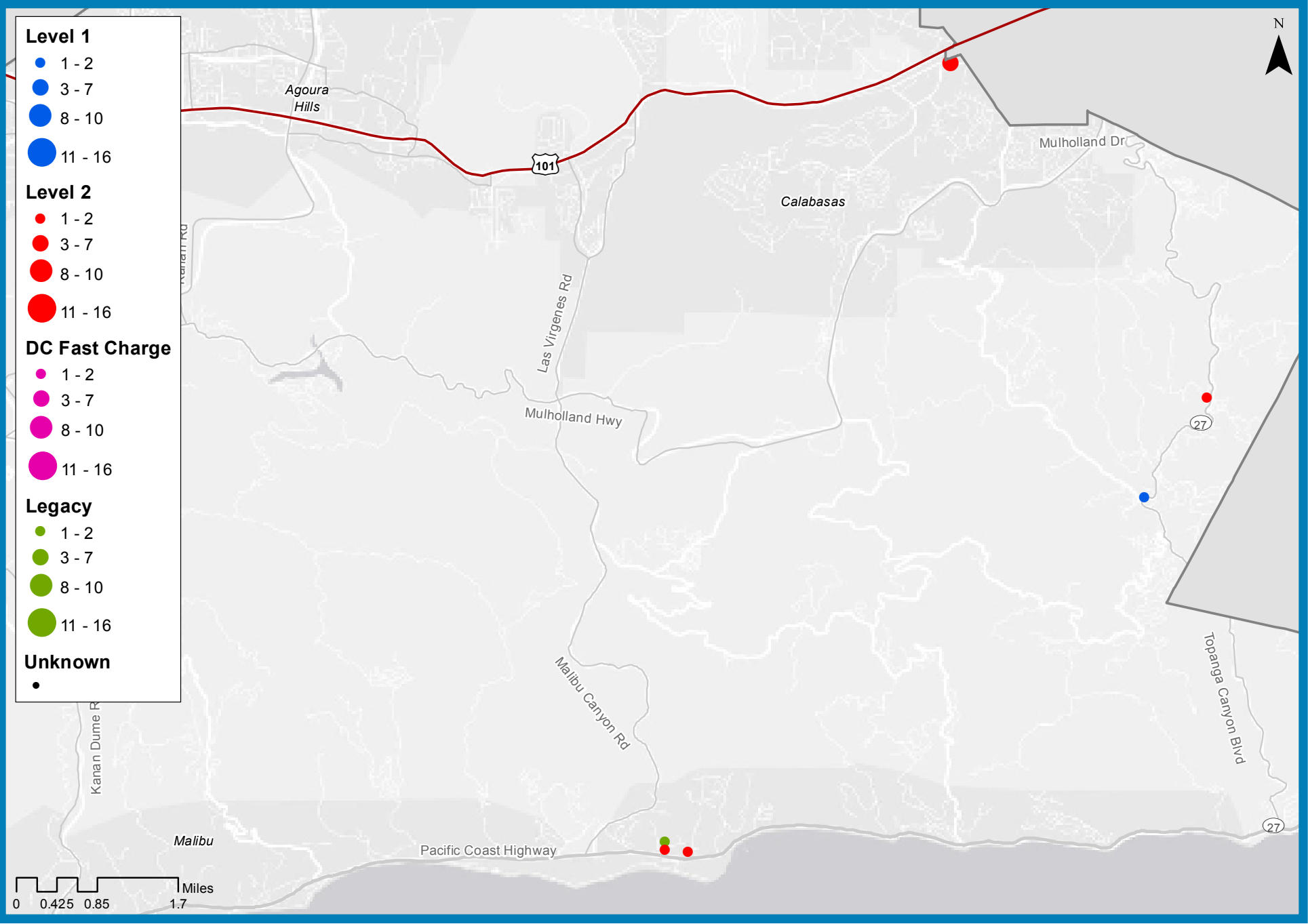




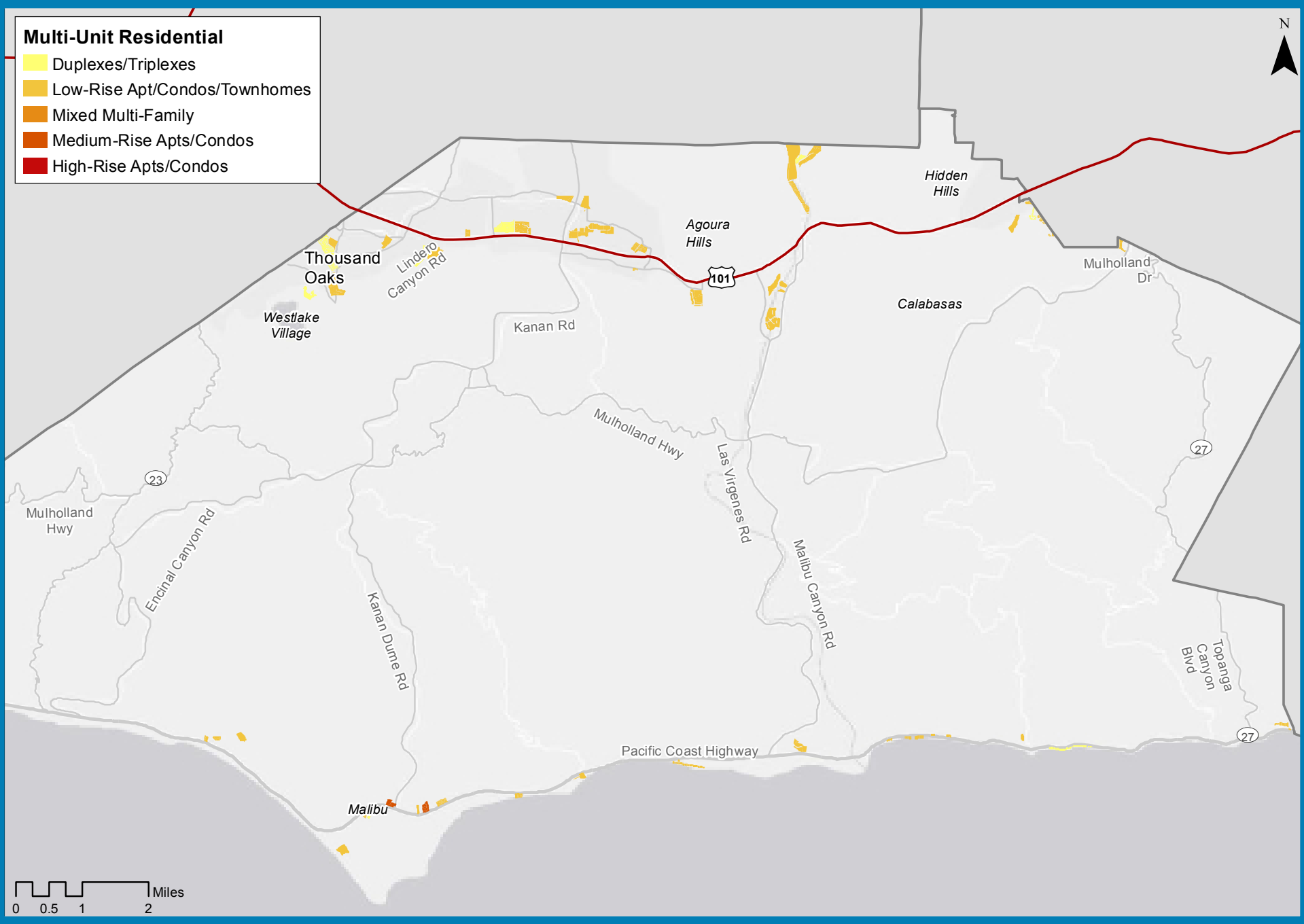
# PEV Morning Peak Destinations and Workplaces



# Publicly-Accessible Charging Stations (Summer/Fall 2012)



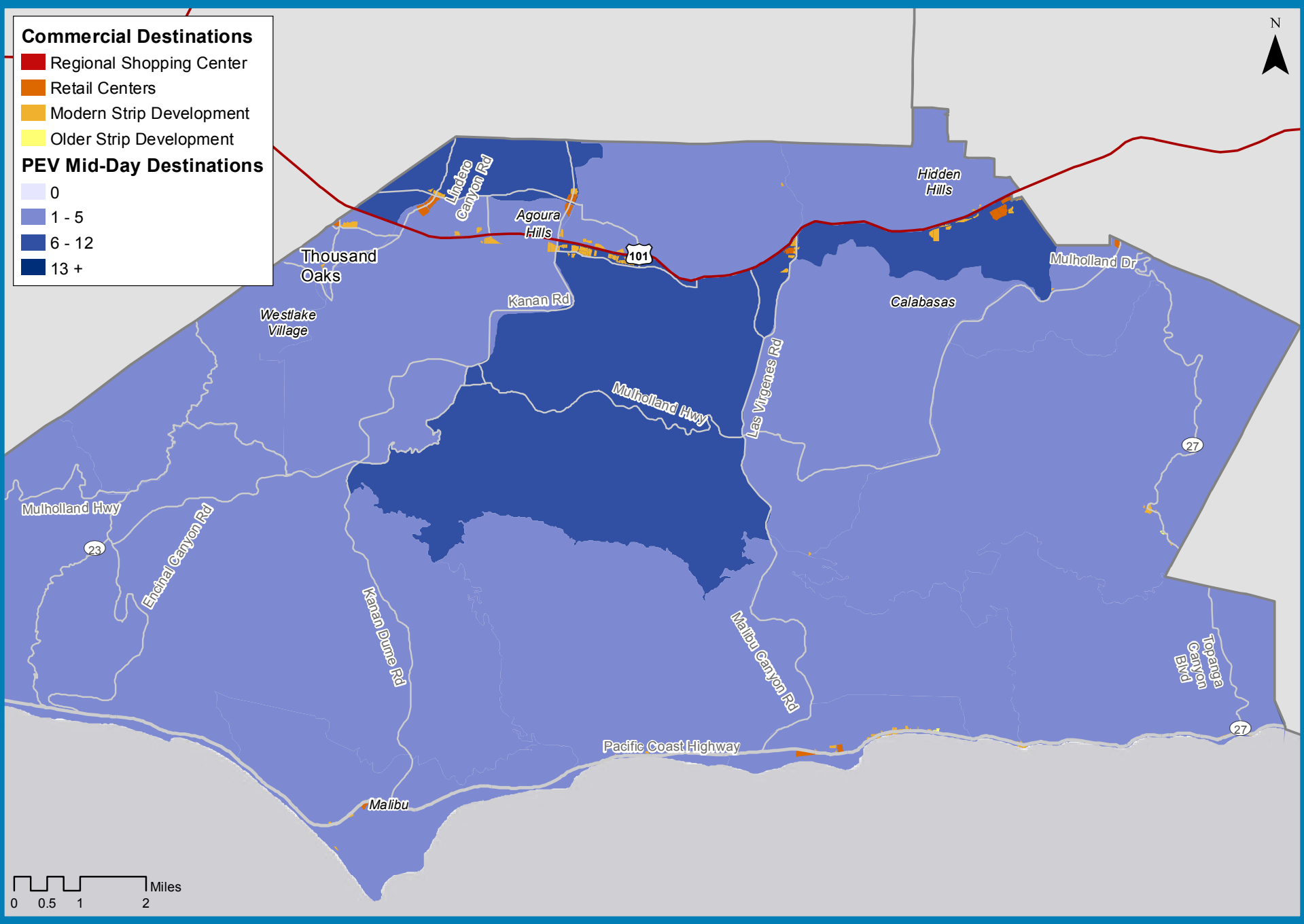
# Multi-Unit Residential



# Commercial (Retail) Destinations



# PEV Mid-Day Destinations and Commercial (Retail) Locations



# Stand-alone Parking Facilities

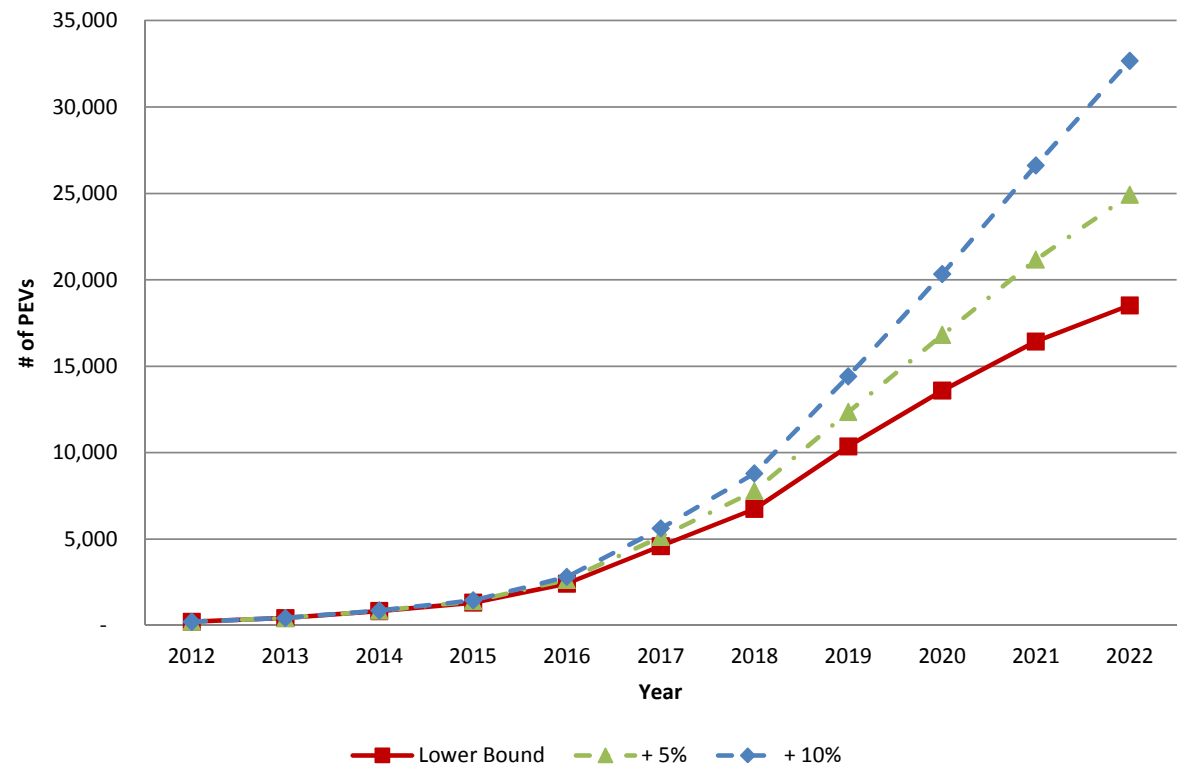




# NORTH LOS ANGELES COUNTY

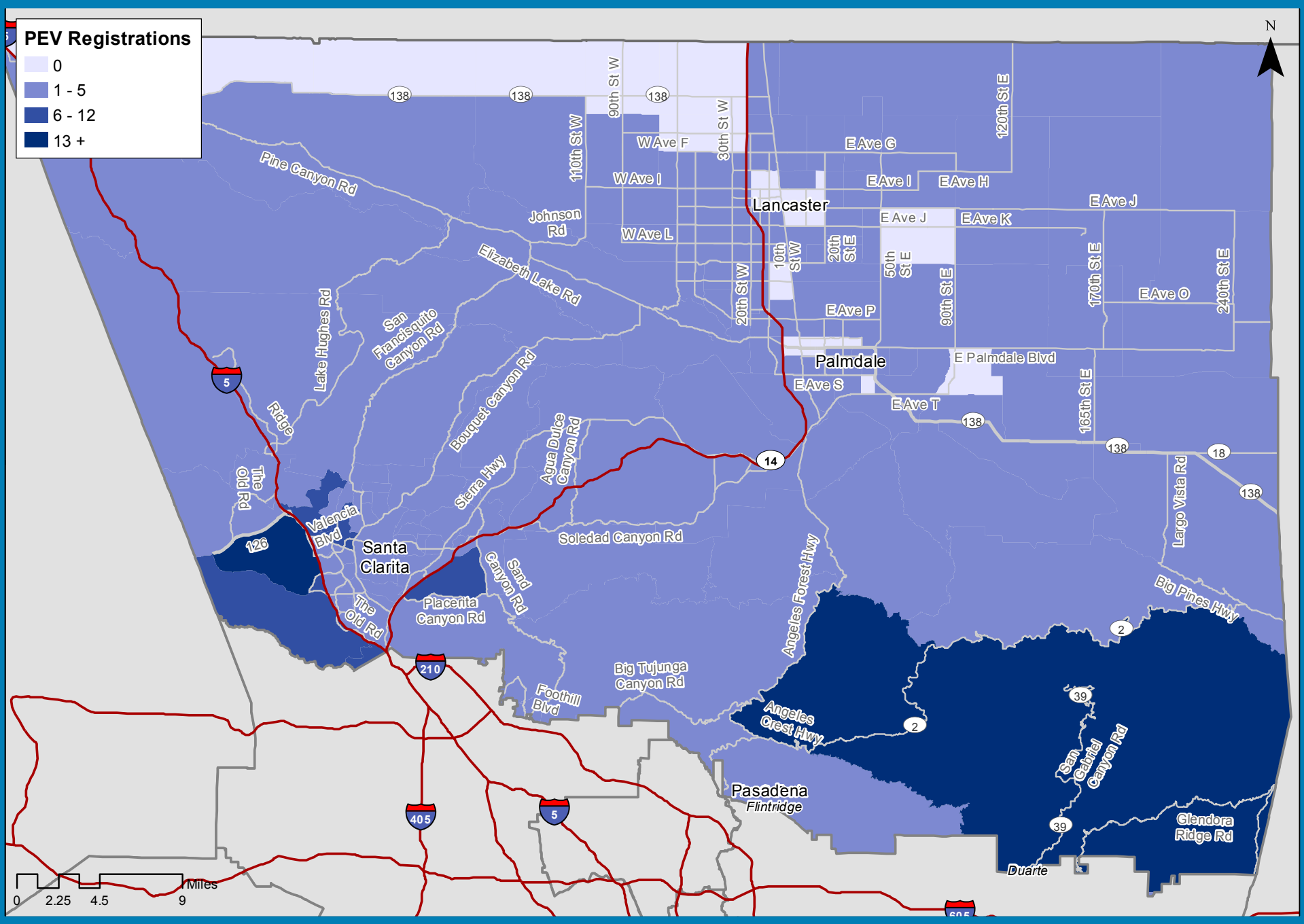
## PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	215	215	215
2013	430	430	430
2014	830	852	860
2015	1,322	1,398	1,455
2016	2,424	2,635	2,814
2017	4,592	5,123	5,611
2018	6,742	7,778	8,800
2019	10,367	12,349	14,412
2020	13,588	16,803	20,330
2021	16,435	21,163	26,622
2022	18,524	24,911	32,668

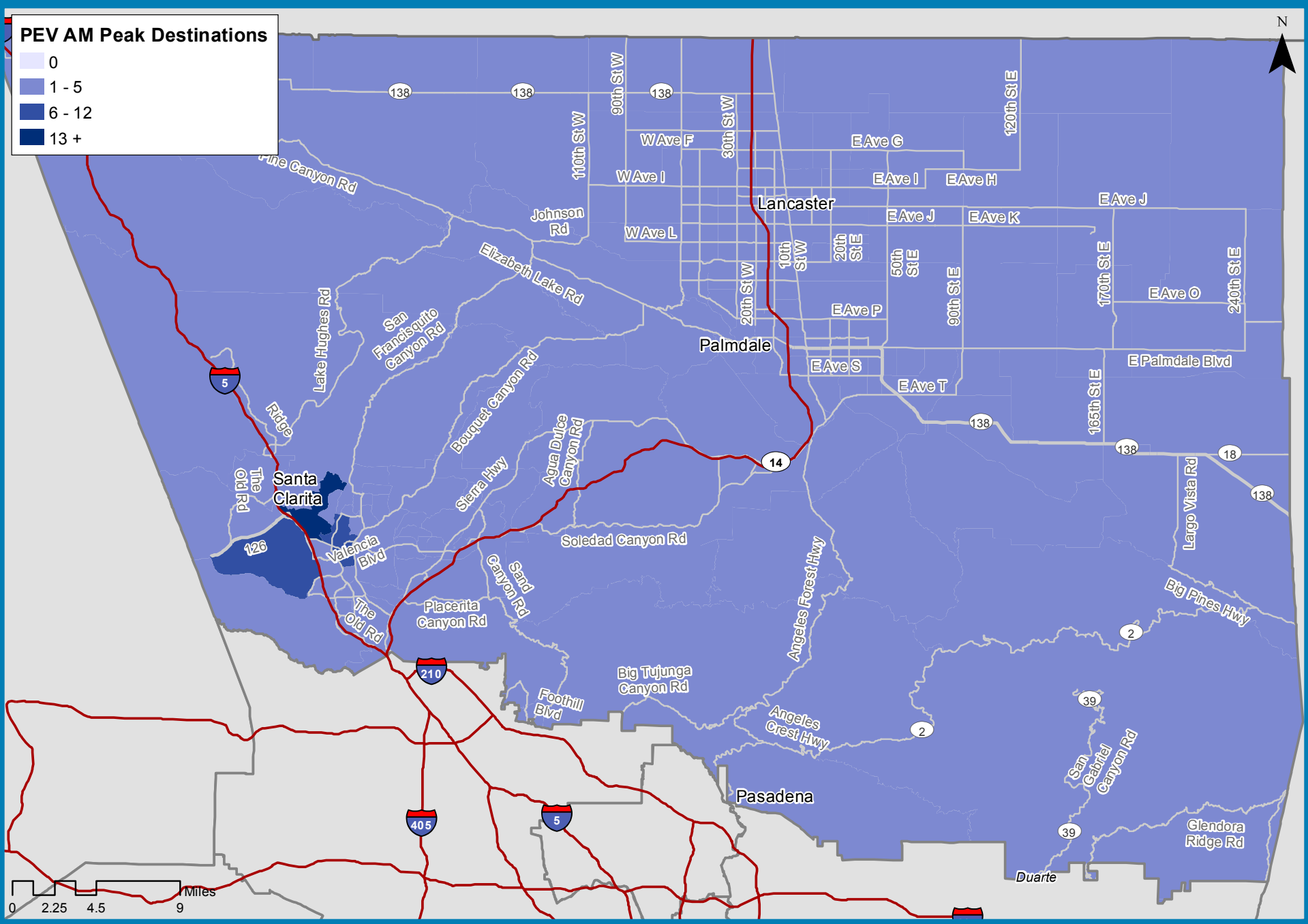


\* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

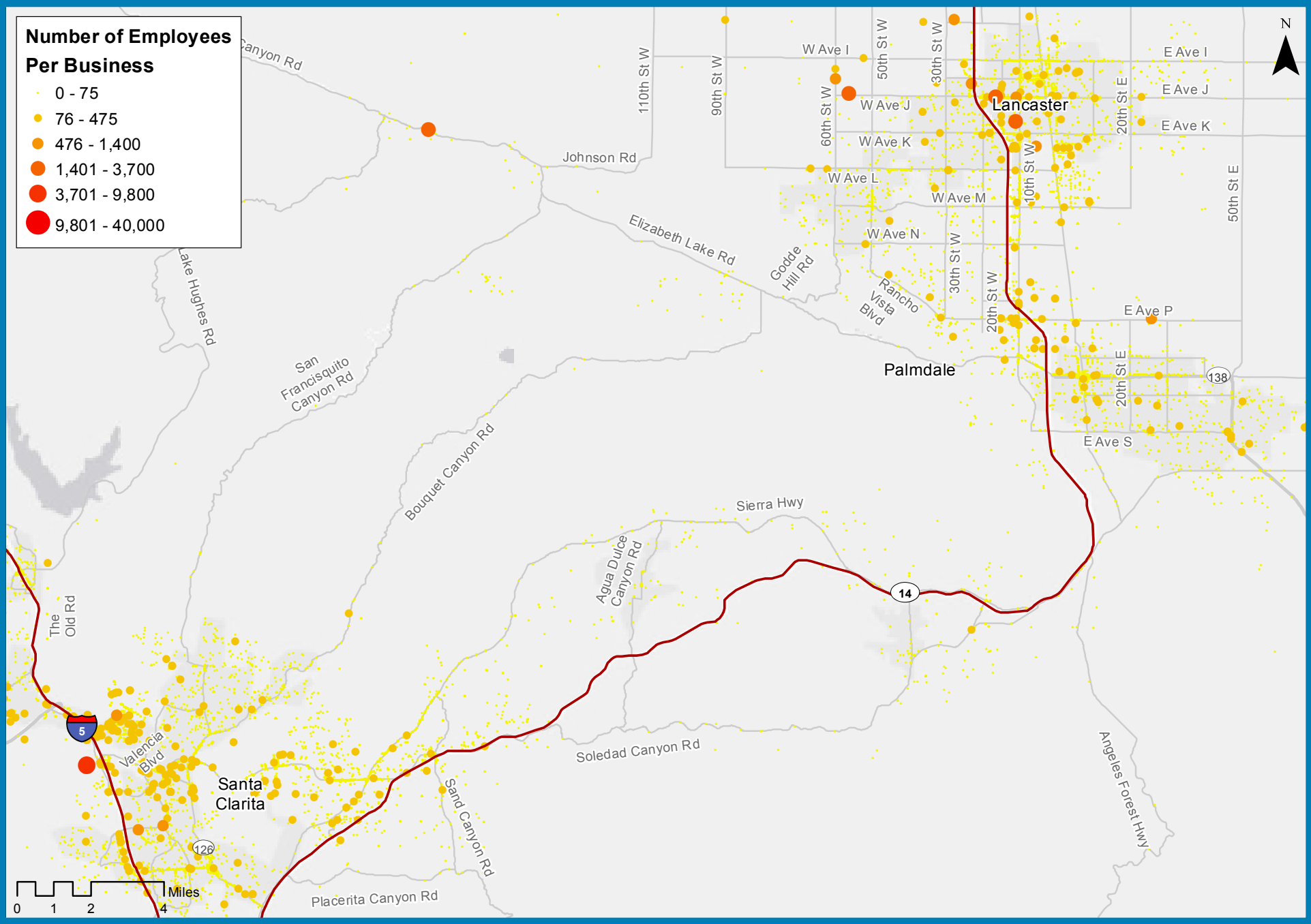
# Plug-in Electric Vehicle Registrations



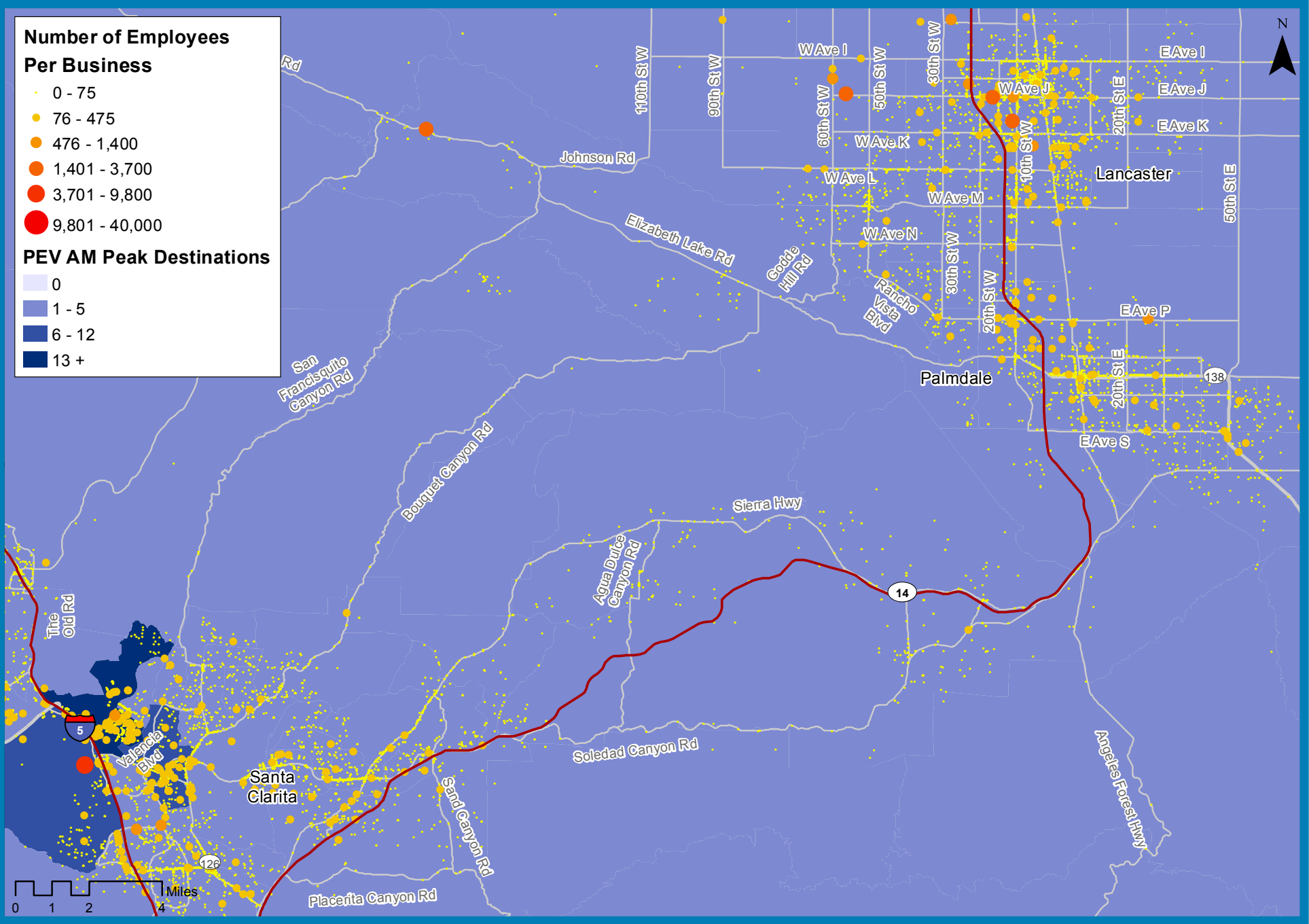
# Plug-in Electric Vehicle Morning Peak Destinations



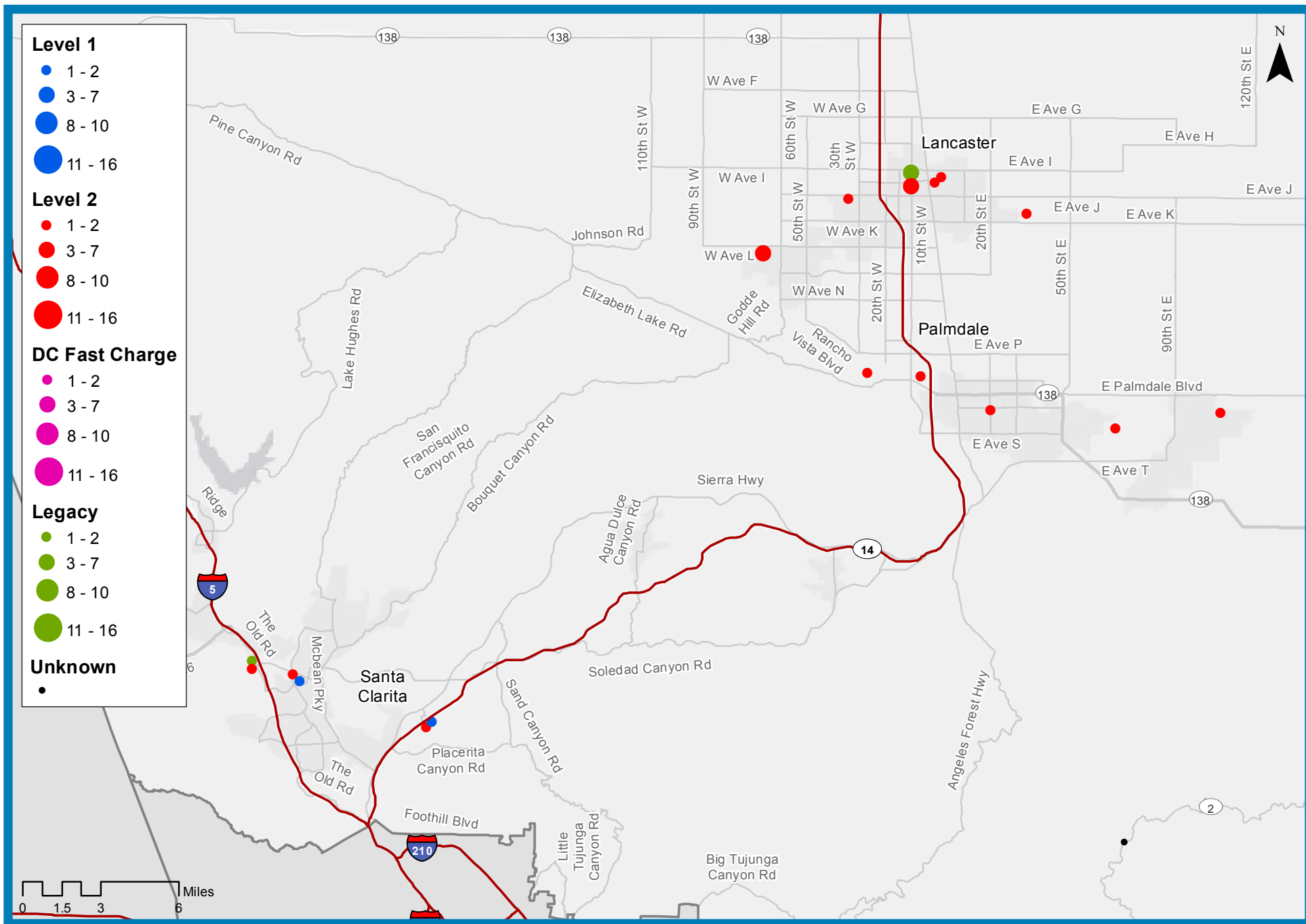
# Workplaces by Number of Employees



# PEV Morning Peak Destinations and Workplaces

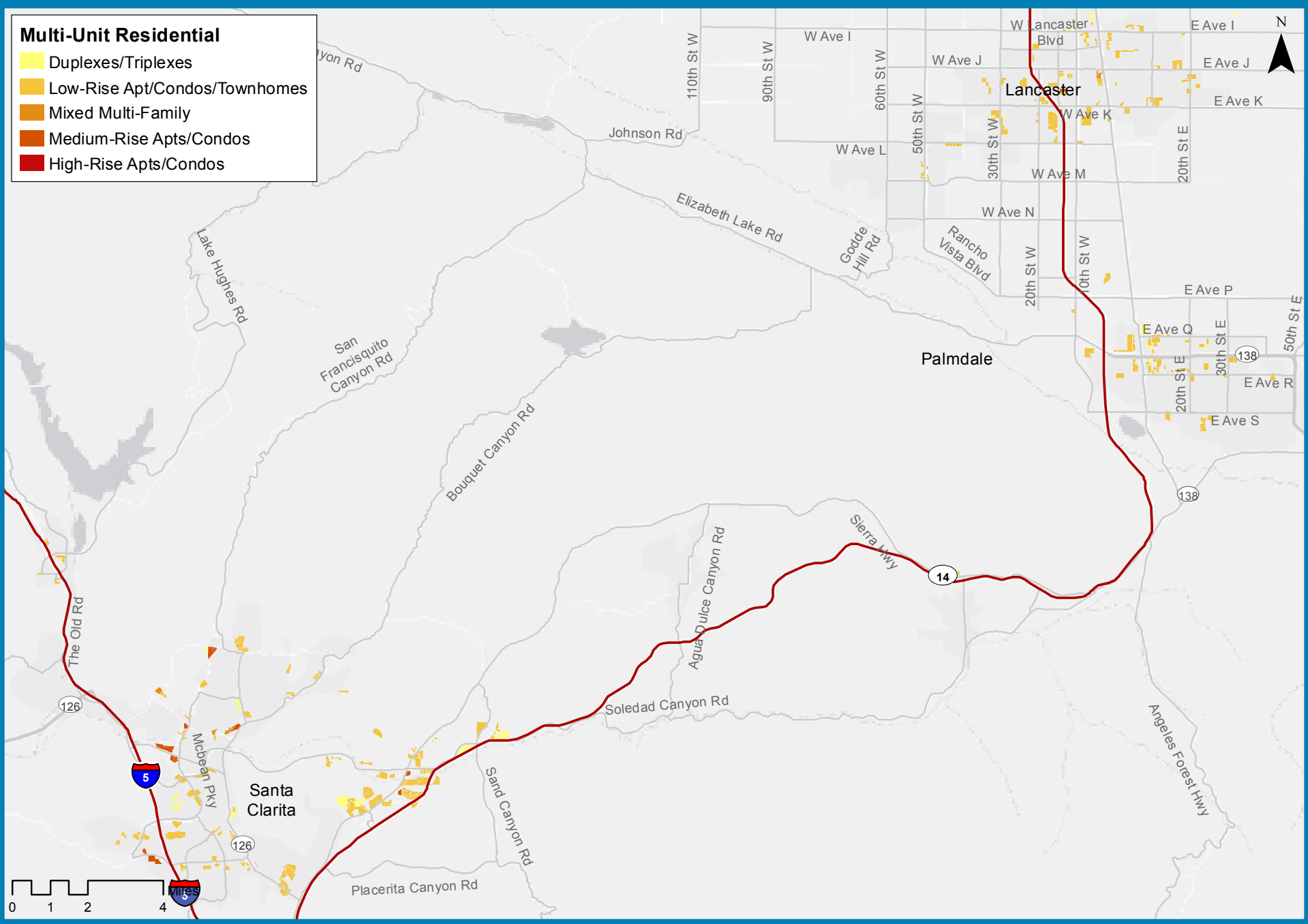


## Publicly-Accessible Charging Stations (Summer/Fall 2012)

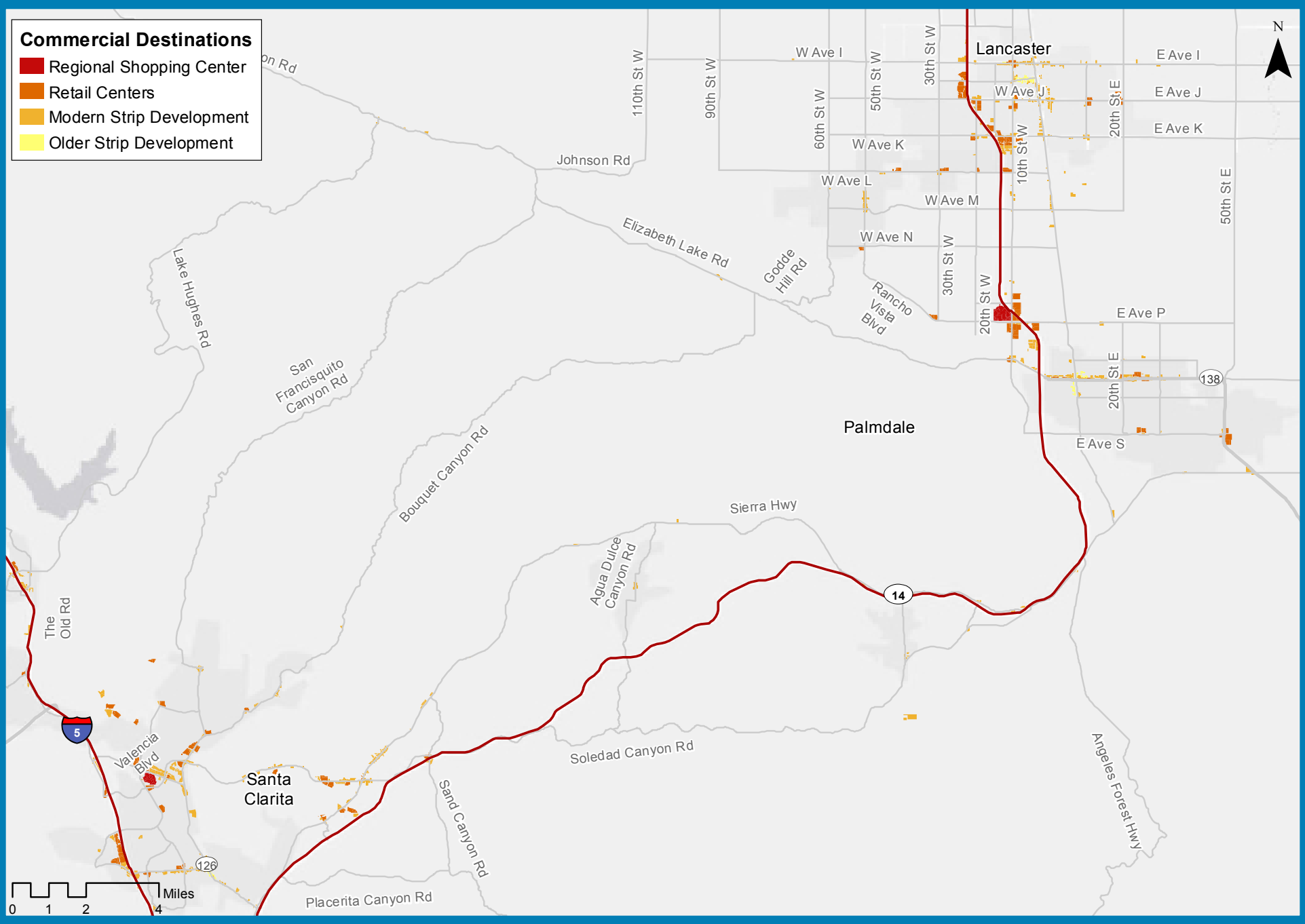




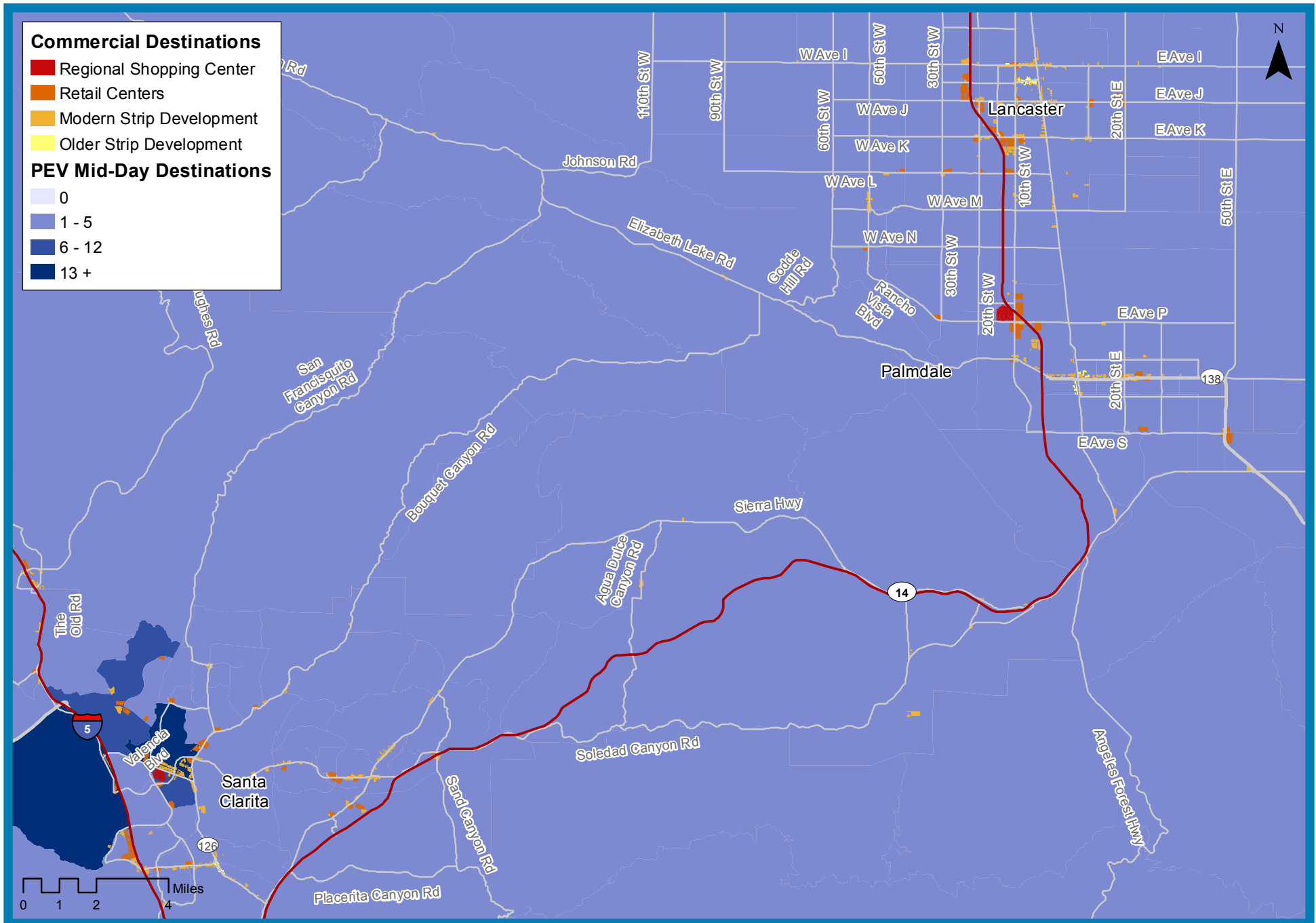
# Multi-Unit Residential



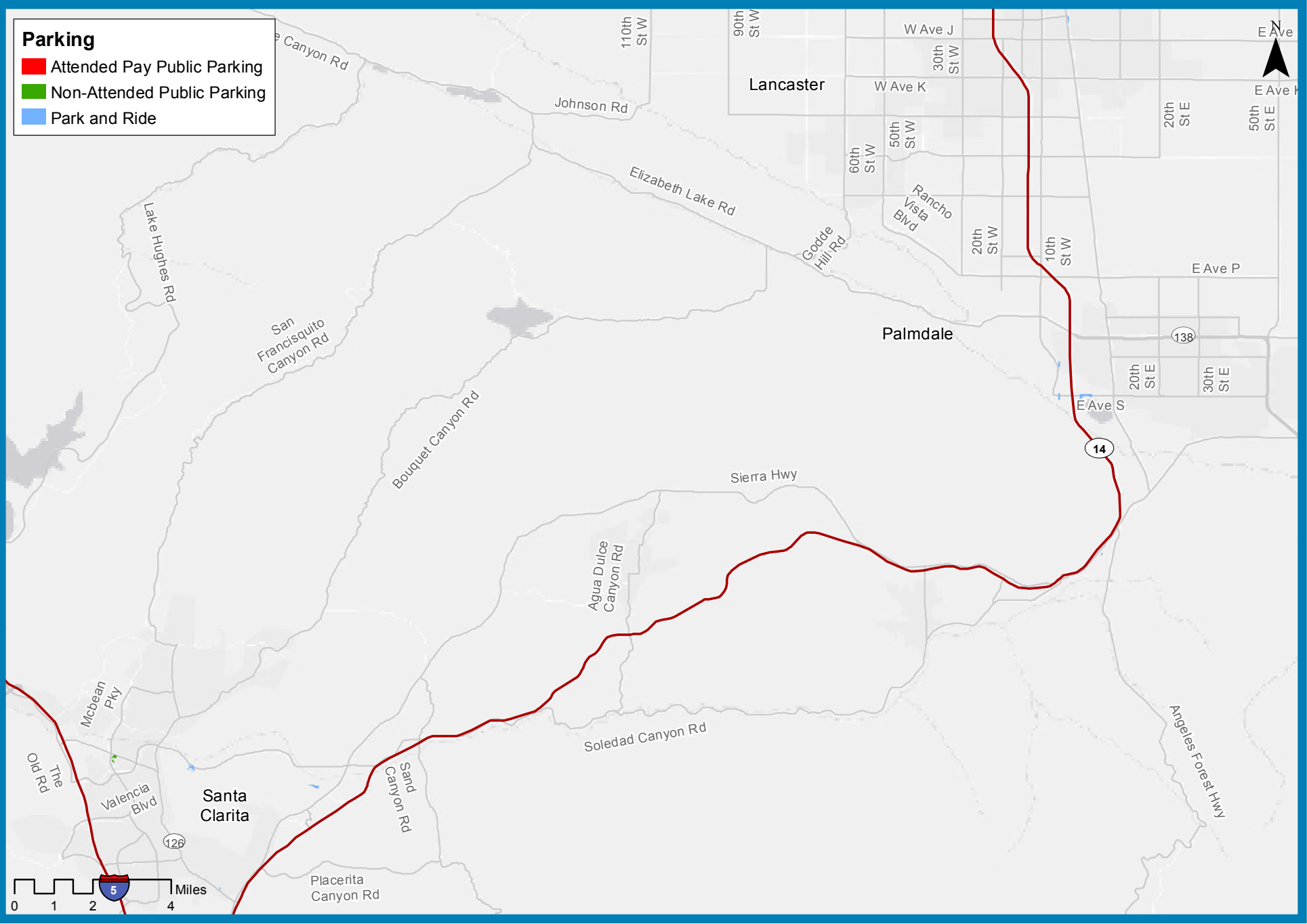
# Commercial (Retail) Destinations



## PEV Mid-Day Destinations and Commercial (Retail) Locations



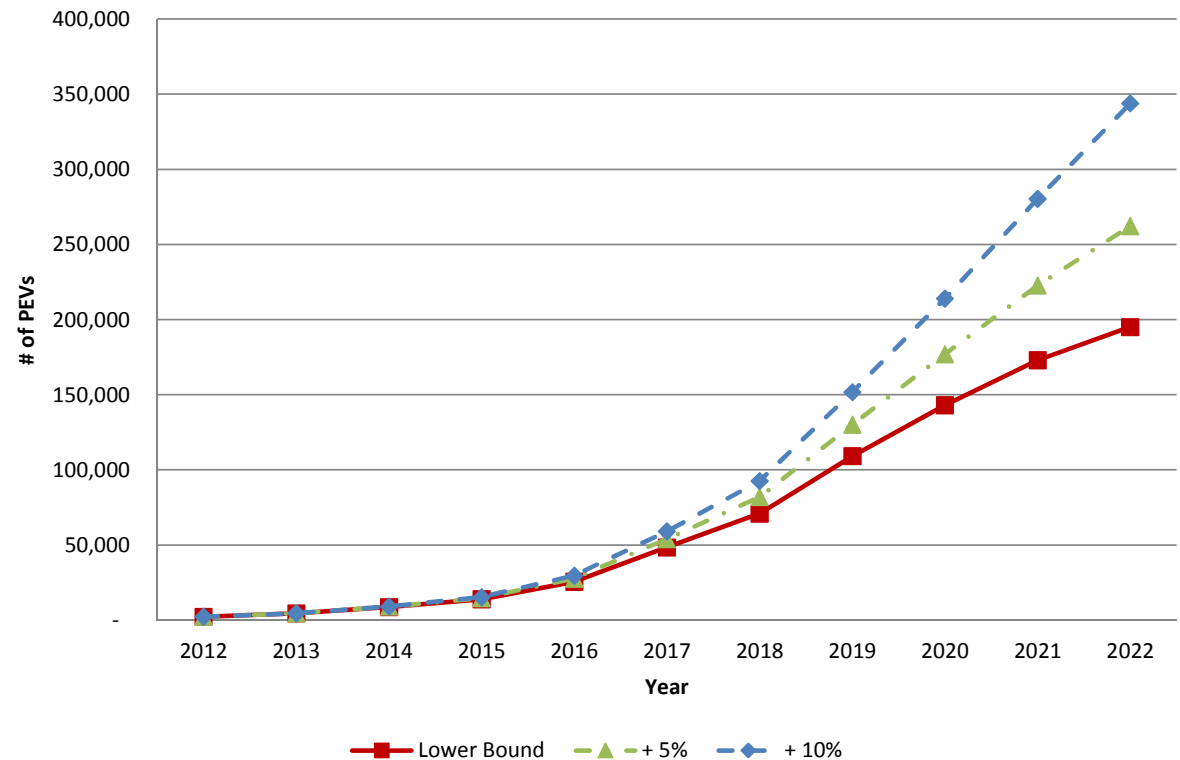
# Stand-alone Parking Facilities



# ORANGE COUNTY COUNCIL OF GOVERNMENTS

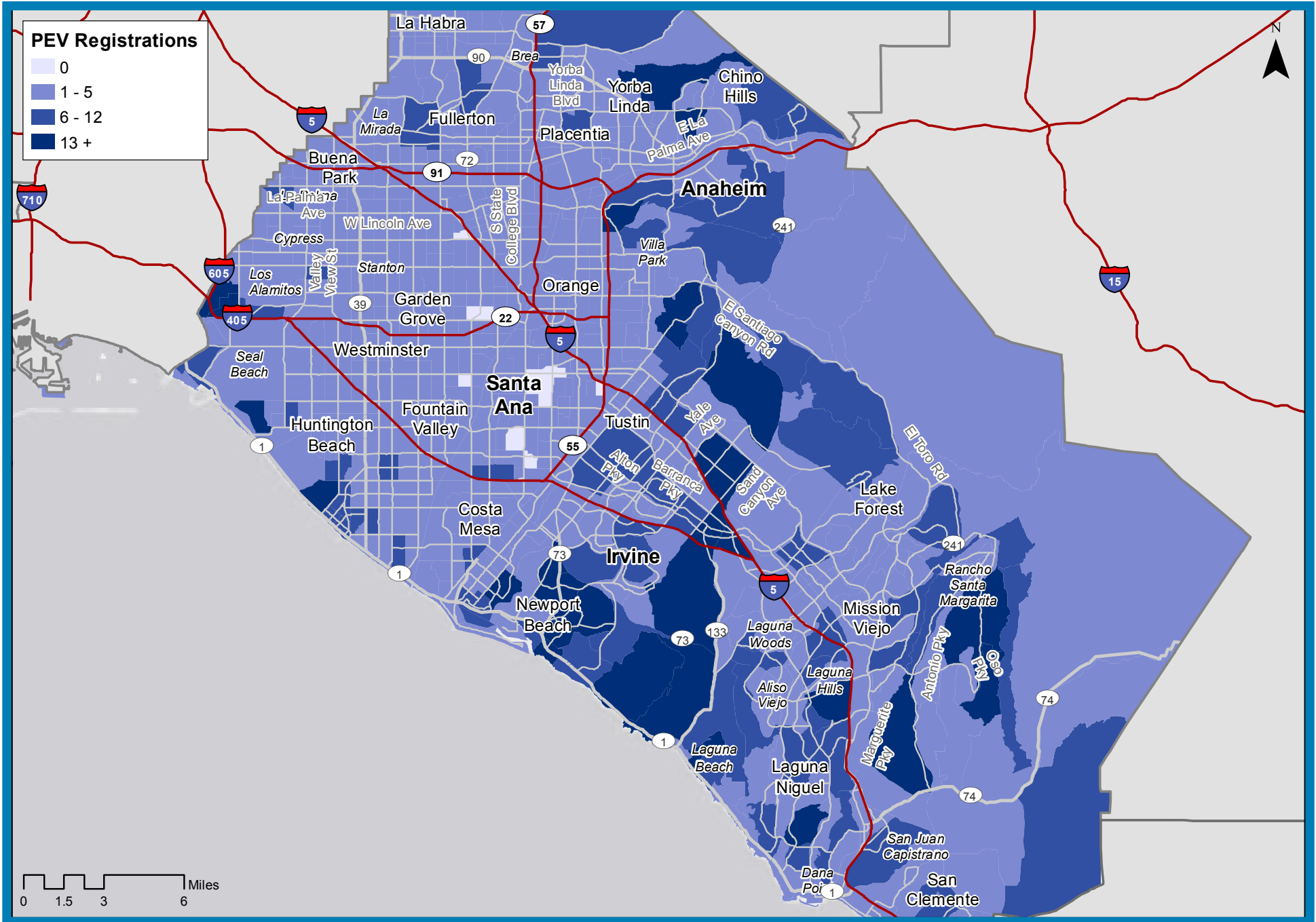
## PEV Growth

Year	Cumulative PEV registrations*		
	Lower Bound	+ 5%	+ 10%
2012	2,263	2,263	2,263
2013	4,526	4,526	4,526
2014	8,741	8,967	9,052
2015	13,910	14,719	15,311
2016	25,516	27,735	29,616
2017	48,333	53,923	59,062
2018	70,963	81,866	92,622
2019	109,122	129,982	151,690
2020	143,026	176,866	213,988
2021	172,985	222,756	280,210
2022	194,971	262,206	343,846

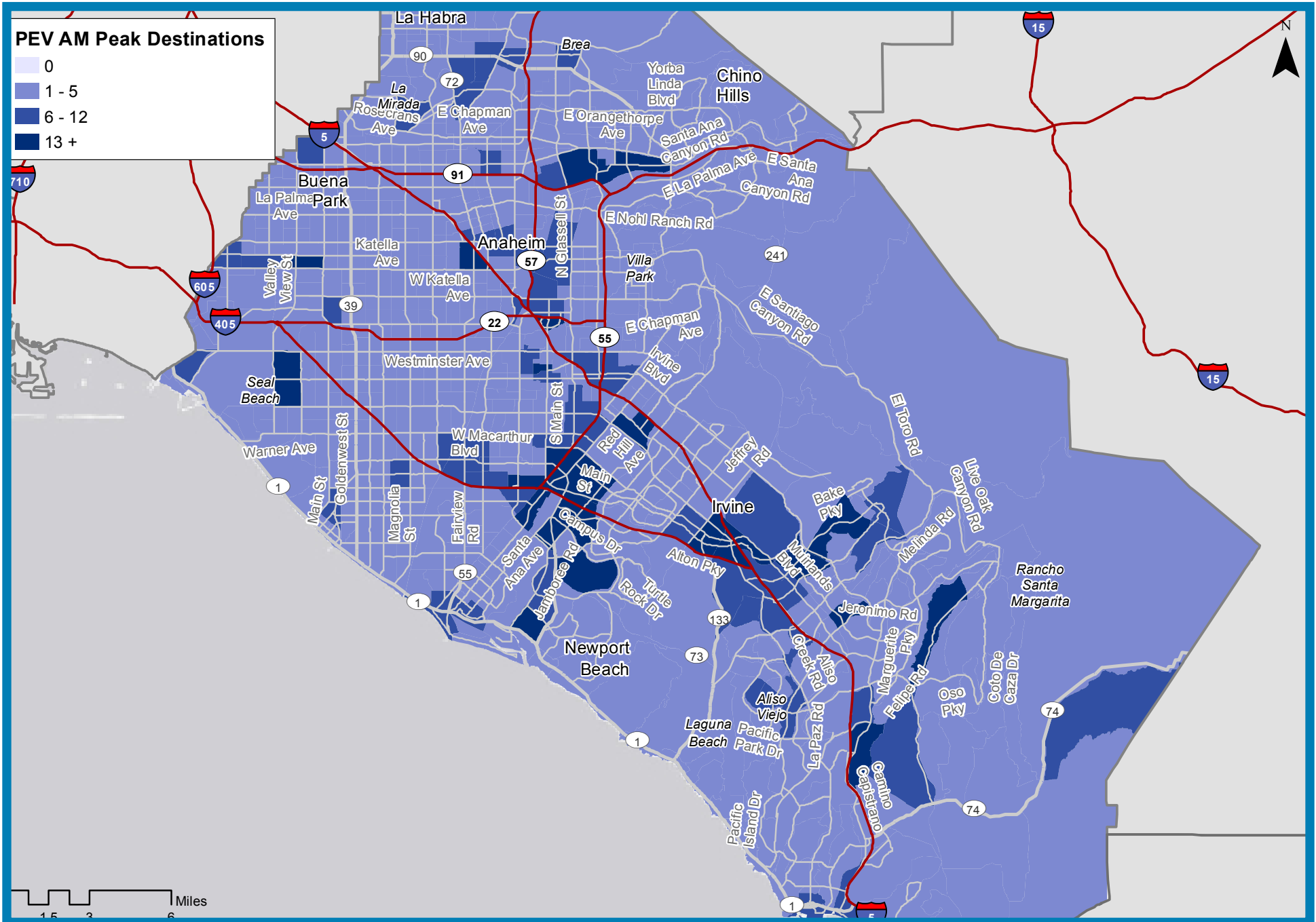


\* The +5% and +10% projections begin in 2014, when uncertainty becomes greater.

## Plug-in Electric Vehicle Registrations

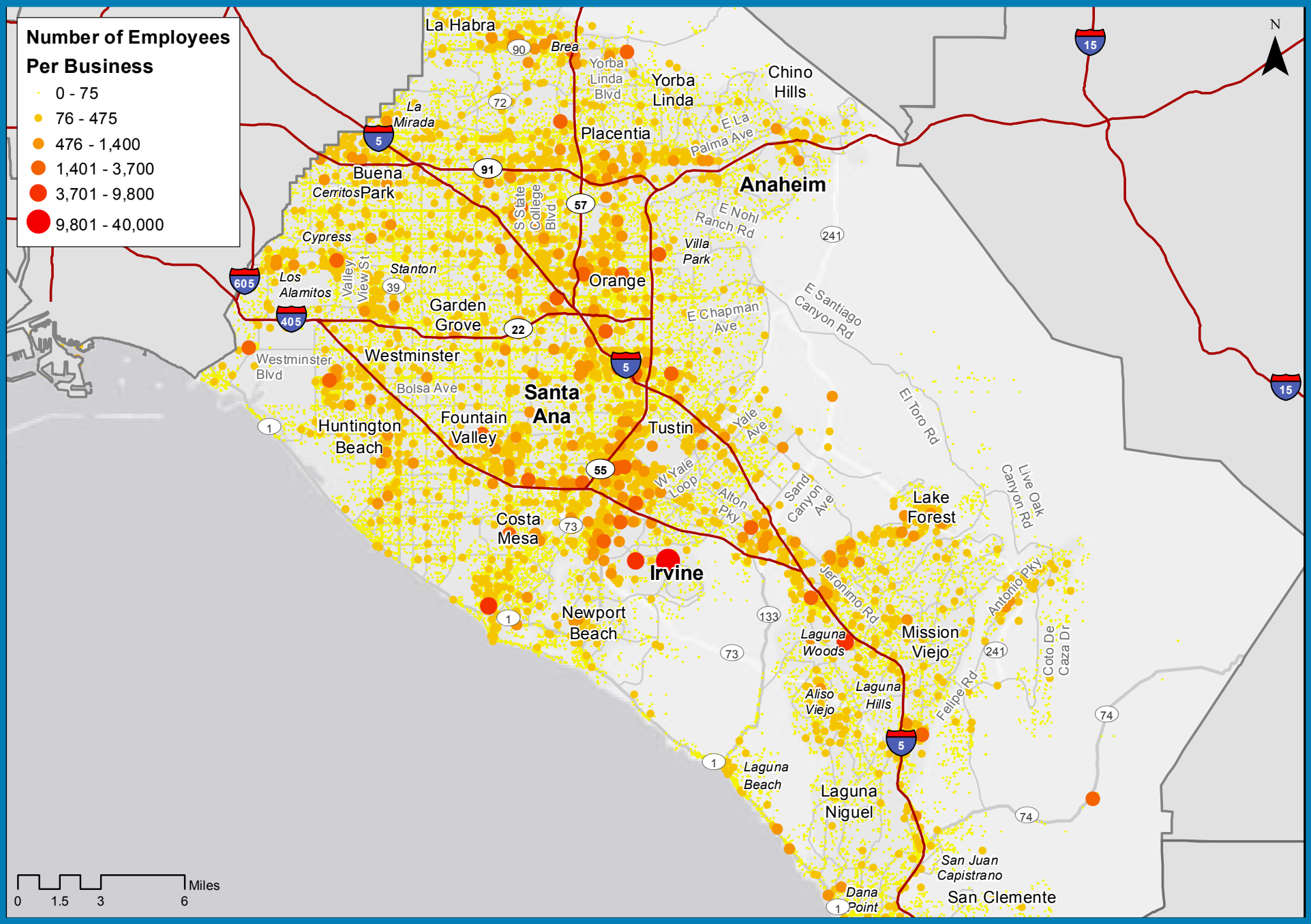


## Plug-in Electric Vehicle Morning Peak Destinations



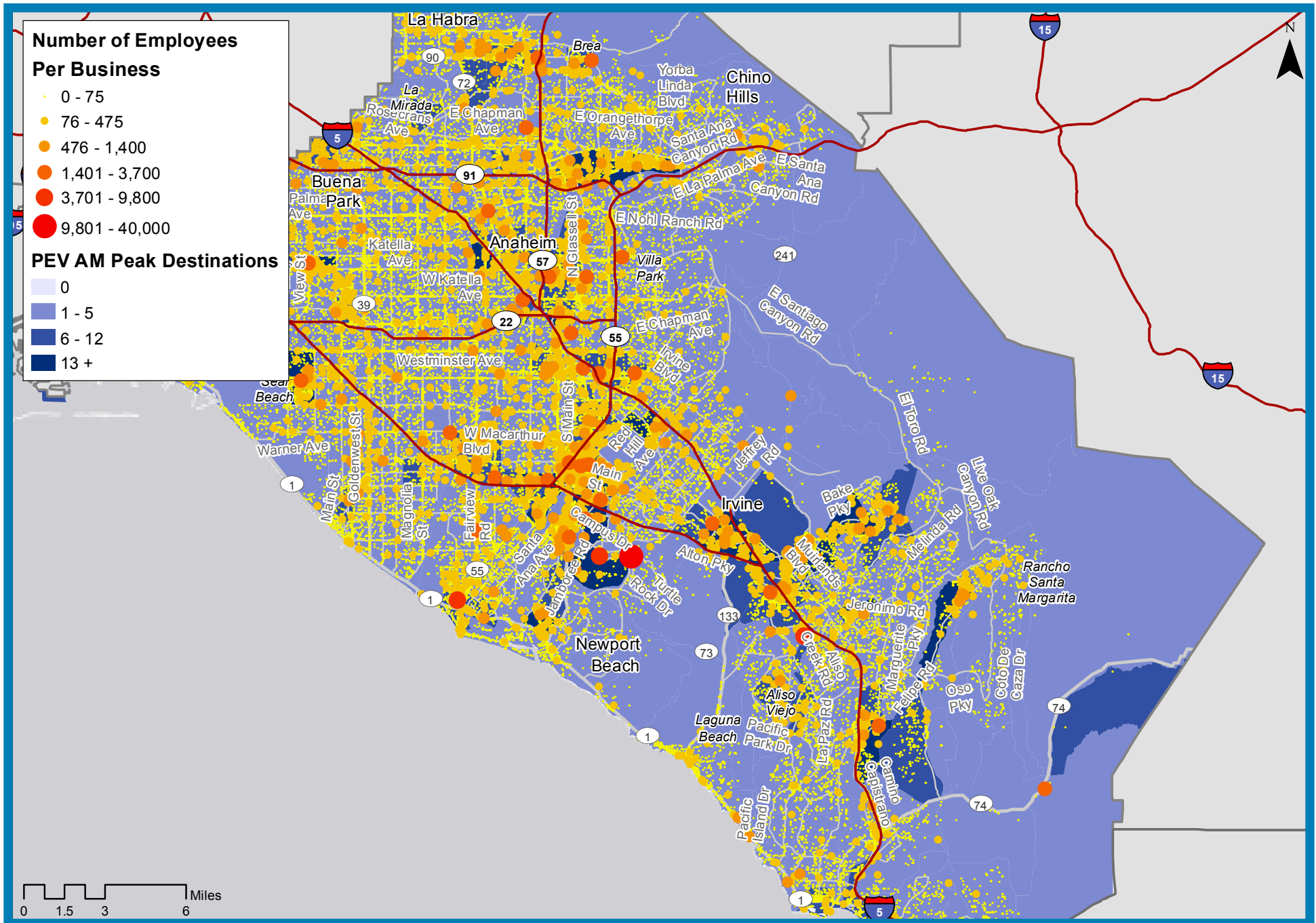


# Workplaces by Number of Employees





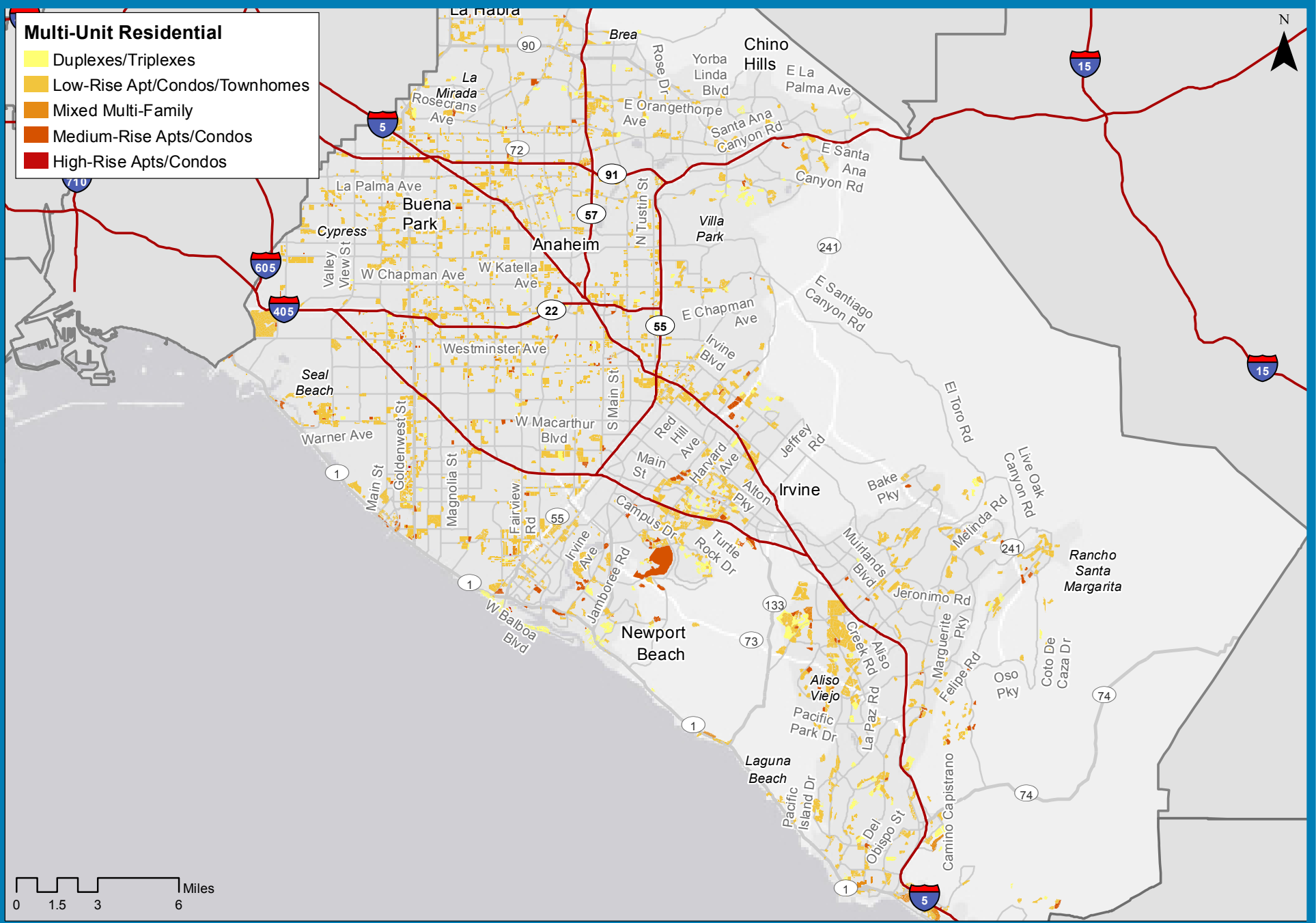
## PEV Morning Peak Destinations and Workplaces



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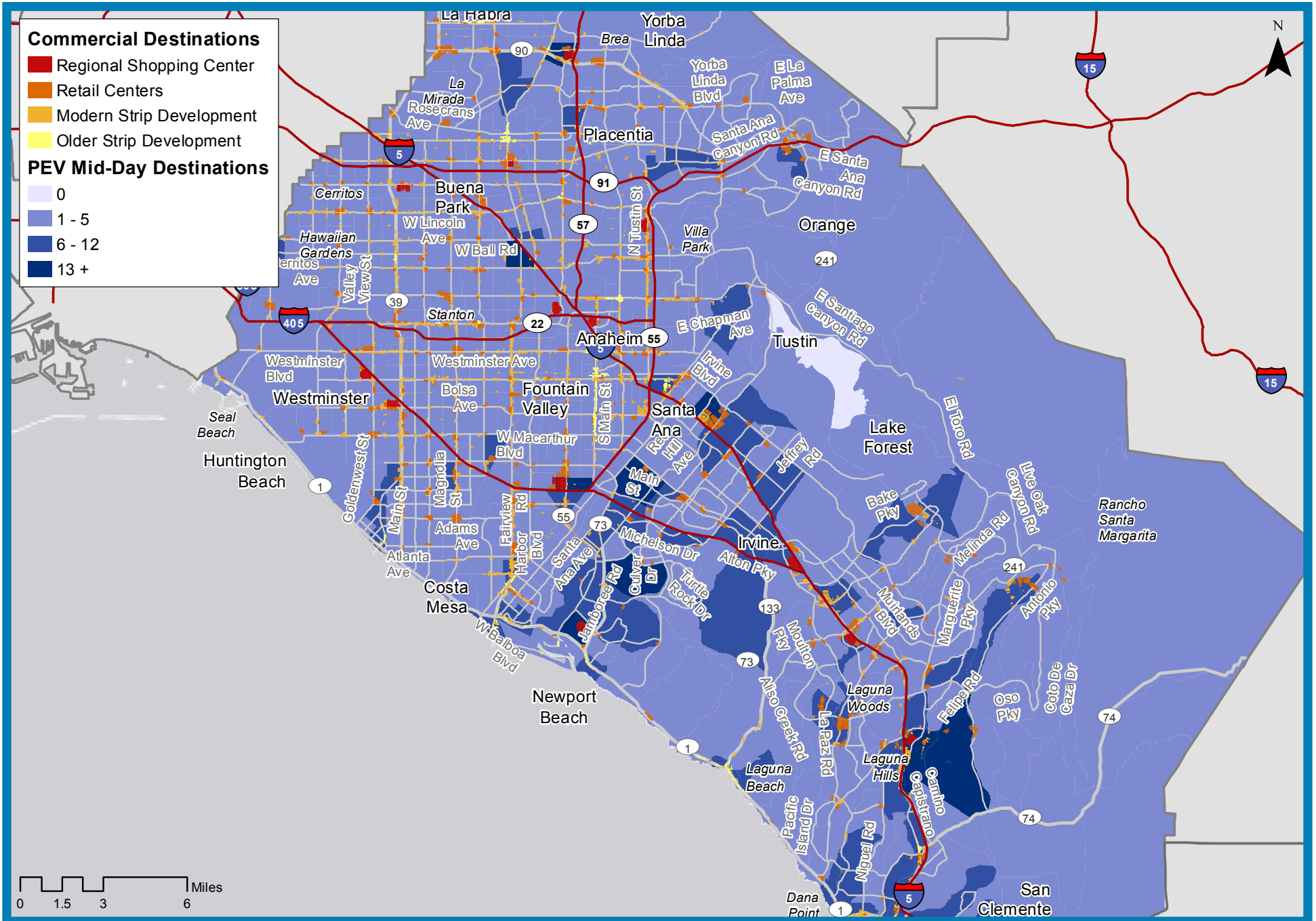
# Multi-Unit Residential



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## PEV Mid-Day Destinations and Commercial (Retail) Locations



# Stand-alone Parking Facilities

